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Francisco Juarez

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EXAMINER

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Please find below and/or attached an Office communication concerning this application or proceeding.

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/821,092
Filing Date: April 08, 2004
Appellant(s): JUAREZ ET AL.

Peter W. Peterson
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 26 FEB 2009 appealing from the Office action mailed 28 OCT 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,716,287	Santiago et al	06-2004
2003/0059535	Luo et al	03/2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1-10 and 20-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Santiago et al (U.S. Patent 6,716,287, hereinafter '287) in view of Luo et al (U.S. PApub 2003/0059535, hereinafter '535).

a. Claim 1 - '287 teaches a reactor comprising a reactor chamber with a first volume, a pedestal to secure a substrate within the chamber using an

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electrostatic chuck, introducing a first gas into the chamber at this volume and exposing the substrate to this gas to deposit a first layer on the substrate, and lowering the pedestal to facilitate removal of the substrate while removing undeposited first gas from the chamber to end deposition (Column 3 Lines 8-24 and 53-65).

b. '287 does not explicitly teach that the first gas is a precursor which reacts with the surface to form the first layer. '287 also does not explicitly teach that enlarging the reaction chamber reduces the concentration of the first gas.

c. '535 teaches cyclical ALD deposition of materials wherein a first reactive gas is passed into a chamber to react with a substrate and form a first layer. After the first layer is formed, the gas flow is stopped and unreacted first reactive gas is removed from the chamber via vacuum pump or purge operations (PG 0036). '535 discusses controlling process parameters to control the thickness of the reactively deposited film, including chamber pressure (PG 0031).

d. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have combined the apparatus of '287 with the technique of '535. Both teachings wish to deposit coatings onto substrates; '535 teaches that controlling chamber pressure can control the thickness of the deposited layers; '287 teaches a means of controlling the chamber pressure by raising and lowering the pedestal (by the ideal gas law, $PV = nRT$, if the volume V above the substrate increases, the pressure P of the gas above the substrate must inherently decrease for constant nRT , which exists

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because the gas flow is stopped before expansion. Further, by the ideal gas law, $P/RT = n/V$, if the volume above the substrate increases, the concentration of the gas n/V above the substrate must inherently decrease for constant P/RT , which exists because the gas flow is stopped before expansion).

4. Claim 2 – the second precursor is taught in '535 PG 0036.
5. Claim 3-4 – purging and pumping are taught in '535 PG 0036.
6. Claims 5-7 – this configuration is taught in '535 PG 0031.
7. Claim 8 – This is a combination of Claims 1, 2 and 5 and is rejected on those grounds.
8. Claims 9-10 - this configuration is taught in '535 PG 0031.
9. Claims 20-22 – '287 Column 3 Lines 37-43 discloses a showerhead with a perforated center section through which the process gases are dispersed into the chamber.
10. Claims 23 and 25 – '535 PG 0036 teaches using ammonia to deposit nitrogen. Nitrogen is distinct from ammonia.
11. Claims 24 and 26 – '535 PG 0036 teaches using hexachlorodisilane (HCD) to deposit silicon. Silicon is distinct from HCD.
12. Claims 27 and 28 – '287 teaches a flow restricting ring which consists of a side wall with lower chamfered corners. The upper corners of the pedestal proximate this side wall are also chamfered to define a gas flow orifice between the side wall and the pedestal. The pedestal does not contact the outer walls of the chamber but occupies a

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majority of the width of same chamber in cross-section. (Column 4 Lines 21-29, Figures 1 and 2).

(10) Response to Argument

With regards to Claims 1, 3-7, 20, 23 and 25:

'287 discloses a mechanism in which a reaction vessel with a movable substrate support can be used to control the flow of gas throughout the chamber. As disclosed in Claim 10 (and generally in Figure 4), the chamber comprises a flow-restriction ring (Item 400) which overlaps the substrate support (Item 138). Claim 10 does not disclose the gas flow holes (Item 406) nor the seal between the ring and the support (Item 402) which prevents direct contact between the ring and the support. In the embodiment of Claim 10, when this substrate support is in the fully raised position, it contacts the flow-restricting ring to form a gas seal. '287 also discloses that this chamber is meant to be used in a chemical vapor deposition (CVD) process (Column 3 Lines 3-8), but is silent as to the specifics of said CVD process. '535 teaches a method of cyclical atomic layer deposition (ALD) deposition. ALD is a recognized and specific method of performing CVD. In the method of '535, a first reactive gas is passed into a chamber to react with a substrate and form a first layer. After the first layer is formed, the gas flow is stopped and unreacted first reactive gas is removed from the chamber via vacuum pump or purge operations (PG 0036). '535 also discusses controlling process parameters to control the thickness of the film, including chamber pressure (PG 0031). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have combined the apparatus of '287 and the technique of '535.

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Both teachings wish to deposit coatings onto substrates using CVD; '535 teaches that controlling the chamber pressure can control the thickness of the deposited layers; '287 teaches a means of controlling the chamber pressure by raising and lowering the pedestal. In specific response to the first full sentence of Page 9 of the Appeal Brief, in the geometry of '287 as discussed above, the only way to remove the unreacted first reactive gas from the chamber is to lower the pedestal to connect the space above the support (first chamber volume) with the space below the support (the sum thereof being the second chamber volume). This change in volume inherently changes the pressure of the first precursor by the ideal gas law, $PV = nRT$. Since the gas flow is stopped before lowering the pedestal, n (number of moles) is constant. R is a gas law constant, and there is no temperature change so T is constant. This means that if the volume of the chamber V is increased, the pressure in the chamber P must necessarily decrease. Finally, Applicant raises an argument of impermissible hindsight with regards to the combination of references since neither reference teaches leaving the precursor in the reaction chamber while it is enlarged. Examiner points out that in Claim 1, Applicant expressly wants to remove undeposited first precursor from the chamber after the chamber is enlarged. As discussed above, '535 teaches wanting to remove excess precursor from the chamber after the layer is deposited and '287 teaches enlarging the chamber volume to provide access to the vacuum pump. Since both teachings want to deposit a layer on a substrate using CVD and the two references in combination teach the two critical parts of the evacuation step, the motivation to combine is provided by the references and thus is not impermissible hindsight.

With regards to Claims 2, 8-10, 21, 22, 24 and 26:

'535 discloses a process in which two or more precursors are cycled between to build up a layer on the deposition surface (PG 0036), with the same sequence of steps for each precursor. Therefore, the analysis of the second group of arguments is the same as above with the exception that there are multiple precursors in play. As '535 teaches multiple precursors, the end result is the same.

With regards to Claims 27-28:

'287 teaches a configuration wherein the support assembly overlaps the flange that forms the upper part of the sidewalls (Claim 10, generally Figure 4, with modifications as discussed above in the first group of arguments above). '287 also teaches configurations where both the flange and support have rounded corners (Column 4 Lines 21-29, Figures 1-2) and teaches that the corners may also be chamfered.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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/Michael G. Miller/

Conferees:

/Michael Cleveland/

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QAS, TC1700